

## Safety for you . . .

### Fun in the Sun Safety

- Stay out of the sun between 11 am and 3 pm when it is at its strongest.
- If you're not sure if it's safe, do the shadow test to make an-on-the-spot UV estimate. Just look at your shadow: if you can't see it at all, dangerous UV rays are reaching you. If your shadow is shorter than you are, you're in high-UV territory. If it extends way out beyond you, you're somewhat safe from UVB rays, although UVA rays remain in effect all day, every day.
- Wear clothes made from tightly woven fabric and a hat which shades the face, ears, and neck.
- Make sure you buy a sun screen which offers "broad spectrum" protection to ward off both UVA and UVB rays. Dermatologists recommend at least SPF15. Don't be fooled by SPF30. It does not give you double the protection of SPF15; it gives you 3% more.
- Chuck out last year's sun screen dregs as sun screen's properties can change with time, especially in extreme heat.
- Wear protective sunglasses as UV rays can cause cataracts and damage to the retina.
- Lips are very vulnerable to skin cancers, so protect them with a balm of at least SPF15.
- Look around you. UV light is reflected by all sorts of surface, particularly water, sand and snow - even grass. Don't rely on shade either; if you can see sky, you can get burnt.
- Sun protection is most important for babies, little children and teenagers. Babies under six months of age are too young for sun screen and should simply be kept out of direct sunlight as much as possible. Two-thirds of sun damage is done before you reach your 15th birthday.



## Security Begins with You

Every person holding a LANL-issued badge can check his or her badge status and access status through a Web query - a Token Card and access to a computer is necessary. If your badge is rejected at an access control reader, you usually will NOT need to contact or come to the Badge Office to find out why. (The Badge Office has dedicated computers available for a badgeholder to check his or her status.)

#### First:

Review the Troubleshooting Card. The card provides a summary of the most common reasons why your badge and/or access status may no longer permit you to enter an area - your badge may have been temporarily or permanently inactivated.

#### Then:

If the Troubleshooting Card does not help you, the next step is to verify the your status through the Web query - your badge may not be working for a reason that requires you to take some

kind of action. If you do not have a Token Card (or do not have it with you at the time) or access to a computer, you should contact your Group Office. Group management has the authority to check the status of every person assigned to the Group's organizational code. **NOTE:** Most Groups have delegated this authority to the Group Administrator or Group Secretary.

#### TO CHECK YOUR STATUS NOW!

Forget how to check your status?

Go to <http://badgecheck.lanl.gov>.

May 2001						
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June 2001						
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Sun	Mon	Tue	Wed	Thu	Fri	Sat

- May 8 Group Meeting at MSL Auditorium
- May 28 Memorial Day
- June 5 Group Meeting at MSL Auditorium

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## Fuel Cell —

### Fuel Processing for Reduction of NO<sub>2</sub> for Lean-Burn Engines

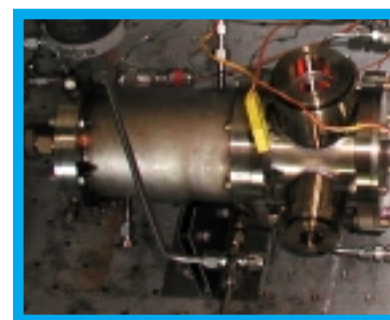


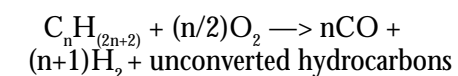
Fig. 1. LANL Adiabatic Partial Oxidation/ Steam Reforming

The fuel cell team in ESA-EPE has worked on fuel reforming for on-board vehicle formation of hydrogen for over a decade. This fuel reforming provides a clean source of hydrogen for use by fuel cell stacks on vehicles. Another application for fuel processing technology is to use fuel processors to convert fuel to help control traditional engine emissions.

Nitrogen oxides (NO<sub>x</sub>) are pollutants produced during the combustion of fuel in internal combustion engines. After formation in the engine, NO<sub>x</sub> is reduced to N<sub>2</sub> over catalysts in after treatment devices (catalytic converters) in typical gasoline engines. However, in diesel engines, excess air is used in the engine, thus an oxidizing environment is present post-combustion, which makes chemical reduction on NO<sub>x</sub> difficult. For the reduction of NO<sub>x</sub> to N<sub>2</sub> to occur, a chemical reductant needs to be added. On-board vehicle urea is being developed

to reduce NO<sub>x</sub>, but this requires the user to periodically refill a urea tank. The addition of diesel fuel to chemically reduce the NO<sub>x</sub> is also being developed, but results using straight diesel fuel have not been promising.

A novel solution for the chemical reduction of NO<sub>x</sub> is using partial oxidation and steam reforming of diesel fuel to produce chemical reductants such as H<sub>2</sub>, CO and small hydrocarbons such as propene (C<sub>3</sub>H<sub>6</sub>). Partial oxidation is a rich burn of fuel, using sub-stoichiometric amounts of oxygen for combustion is shown for O/C < 1):



Small hydrocarbons (such as propene), H<sub>2</sub> and CO are known to catalyze the reduction of NO<sub>2</sub> and are known to regenerate NO<sub>x</sub> adsorbers. The production of small hydrocarbons by partial oxidation of hydrocarbons (diesel fuel) and subsequent addition to diesel exhaust promotes NO<sub>x</sub> reduction and proves to be a valuable emissions control technology. This emissions control technology would be consumer friendly, as maintenance is not required, and off-board refueling of a reductant is also not required.

We have developed a partial oxidation (POx) reactor with the supporting test

equipment to test the feasibility of generating reductants from diesel fuel onboard a vehicle for the reduction of NO<sub>x</sub> emissions. This partial oxidation reactor is shown in Fig. 1. The reactor reacts diesel fuel with air (or simulated

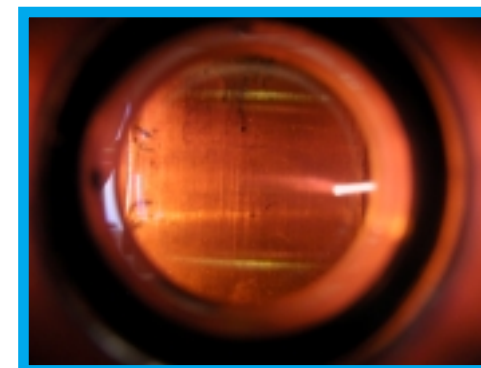


Fig. 2. LANL Adiabatic Partial View through laser window during operation.

diesel engine exhaust) in a fuel-rich mixture to generate a gas stream containing H<sub>2</sub>, CO, CO<sub>2</sub>, N<sub>2</sub>, and small hydrocarbons. This reactor also has incorporated windows for analysis of the effluent stream by a laser to observe conditions under which carbon formation occurs. An image through one of the windows is shown in Fig. 2 during operation. Carbon formation is an important consideration of operation, as carbon formation will inhibit durability of the system. Fig. 3 shows

*Fuel Processing for Reduction of NO<sub>2</sub> continued on page 2*



calculated equilibrium carbon formation for various operating conditions for a 'gasoline' type fuel. At higher temperatures, less steam content is

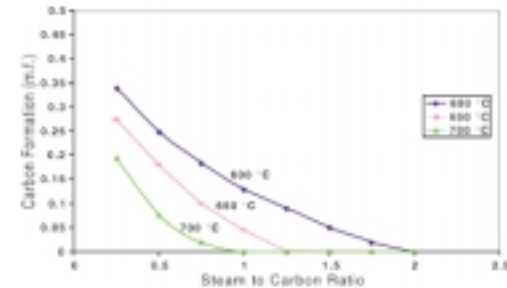


Fig. 3. Calculated Carbon Equilibrium as a Function of Temperature and Steam Content.

required to prevent carbon formation in the reactor. The work in ESA-EPE varies operating conditions to map the outlet composition as a function of operating conditions and allows for subsequent optimization of the production of the desired reductants. Carbon formation is monitored as a function of fuel component and operating condition. The oxidant feed is simulated for operation from ambient air and from engine exhaust. Reactor operation is modeled by known thermodynamics and equilibrium quantities to identify the conditions for initial operation of the reactor.

### Timely Quotes

*Time is nature's way of making sure that everything doesn't happen at once.*  
— Anonymous

*The sooner I fall behind, the more time I have to catch up.*  
— Anonymous

*Words strain, crack, and some-time break, under the burden.*  
— T. S. Eliot (1888-1965)

### Timely Quotes

## Coyne Prenger

### A modern day Geppetto, tinkering with time.



**Seth Thomas City Series** – Mass-produced shelf clock by Seth Thomas. Clock equivalent of the model-T. Sold for about \$1 to \$2 dollars in 1880's. This is the Chicago and there were many styles named after other cities. Clock movement is very durable and well suited for frontier conditions. Very popular clock and very collectable.



**400 Day Kaiser Universe** – An unusual example of a 400 Day or Anniversary clock that includes a moon phase. Dates to about 1960. The 400 day movement in these clocks is highly efficient and, therefore, quite temperamental requiring careful treatment.

Like a modern day Geppetto, Coyne Prenger spends many of his spare moments tinkering with time. That is, he collects and restores antique clocks. Coyne first became interested in antique clocks when a colleague introduced him to the hobby in 1985. Coyne, enamored with the idea that an intricate antique device could still work as well now as the day it was made, took up the hobby with vigor.

The past is history, the future is a mystery, and today is a gift; that's why they call it the present.

— Deepak Chopra

Coyne's first acquisition was an 1895 weight-driven Vienna Regulator clock, which is still one of his favorites. It has an elegant temperature-compensated pendulum and is reasonably accurate. He looks particularly for American and German clocks with brass movements (the mechanical parts of a clock) dating from about 1830 to 1930. His favorite clocks are "400-day clocks," which come in a variety of styles. Four-hundred-day clocks, better known today as anniversary clocks, are among his favorites because of their highly efficient movements. When properly set up, they run up to 400 days on a single winding.

Because he prefers to work on restoring the movements, Coyne tends to look for clocks with casings in good condition regardless of the condition of the internal movements. Even if a clock is in working order when he purchases it, Coyne disassembles and cleans the movement, polishes each pivot, and reassembles it, making adjustments to ensure easy motion of the parts. This usually takes two to four hours. More time is required if the clock needs major reworking (worn bushings, bent pivots, or broken springs). Some clocks require replacement parts, which are not often easy to find. However, several clock supply houses are still in business, Coyne relies on them to find the parts he

needs. Occasionally, though, he has to make some of the pieces himself.

Antique clocks are highly collectible precisely because they are difficult to find—as the years pass, there are fewer and fewer of them around. Fires, floods and encounters with the floor take their toll. Collectors frequent estate

sales, antique stores, and the internet in search of collectible clocks. The National Association of Watch and Clock Collectors (NAWCC) also holds special marts and conferences where clock collectors can buy and sell clocks.

Each clock—with its casing, internal mechanisms, and workmanship—holds a hidden treasure of history about itself and the period from which it came. Coyne immerses himself in the history of each clock he collects and is able to relate interesting tales about each clock in his collection. Coyne has 20 antique clocks in his home here in Los Alamos, and another 20 or so clocks reside in the homes of his family members.

Owning and operating so many clocks, Coyne's favorite piece of clock lore is to be expected:

"If you have one clock you THINK you know what time it is, if you have two clocks you DON'T know what time it is, and if you have several clocks you know how difficult it is to determine the time."

—Anon.



**Ithaca Perpetual Calendar Clock** – This is an example of the 'Bank O' model. This clock keeps track of the # of days in each month and even knows leap year. Clock would have been displayed in a public building, most probably a bank or library because of its time and date features. Dates from about 1885.



**Vienna Regulator** – Sophisticated parlor clock of the 1890's. This one is German made but the style is Viennese. Movement is refined being powered by only 3 lb weights. Would have been owned by an aristocrat. Sold for about \$12-\$15 new.



**E Howard Regulator** – Parlor-sized wall clock made by a company that specialized in large public clocks. Brass movement has thick plates and thin pivots and is capable of high precision. Rosewood finish is hand painted. Dates from about 1880.